Electron Drift Corrections

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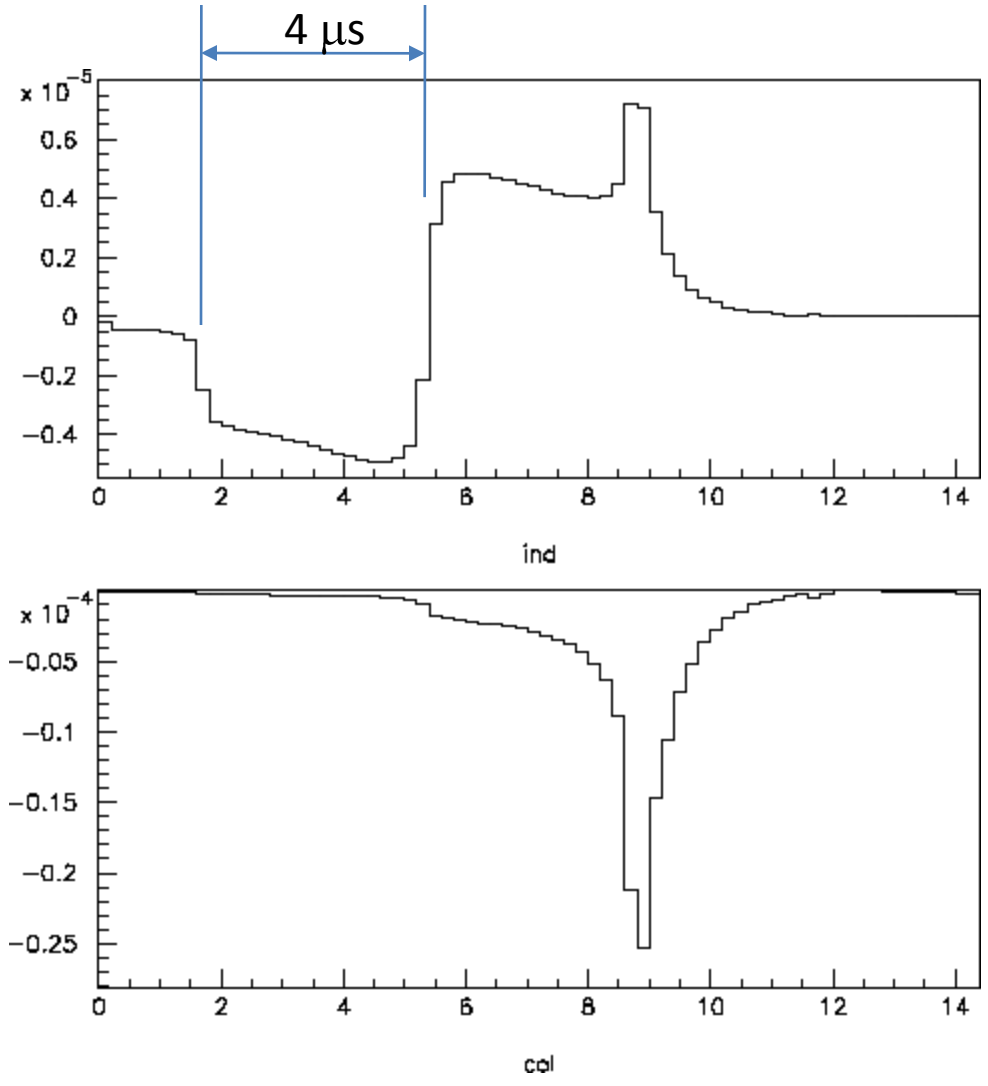
Data/MC Hit Shape Comparison

- Compare hits on a Bo cosmic ray track with simulated Bo track (Run 262 Evt 55)
  - Simulated Bo track has the same direction and drift distance as the real cosmic ray track
  - Create a hit template in the induction and collection plane = the average shape from 15 wire planes
    - Compare data hit template with MC hit template
  - Apply corrections to the MC simulation of electron drift to match MC hits with data hits

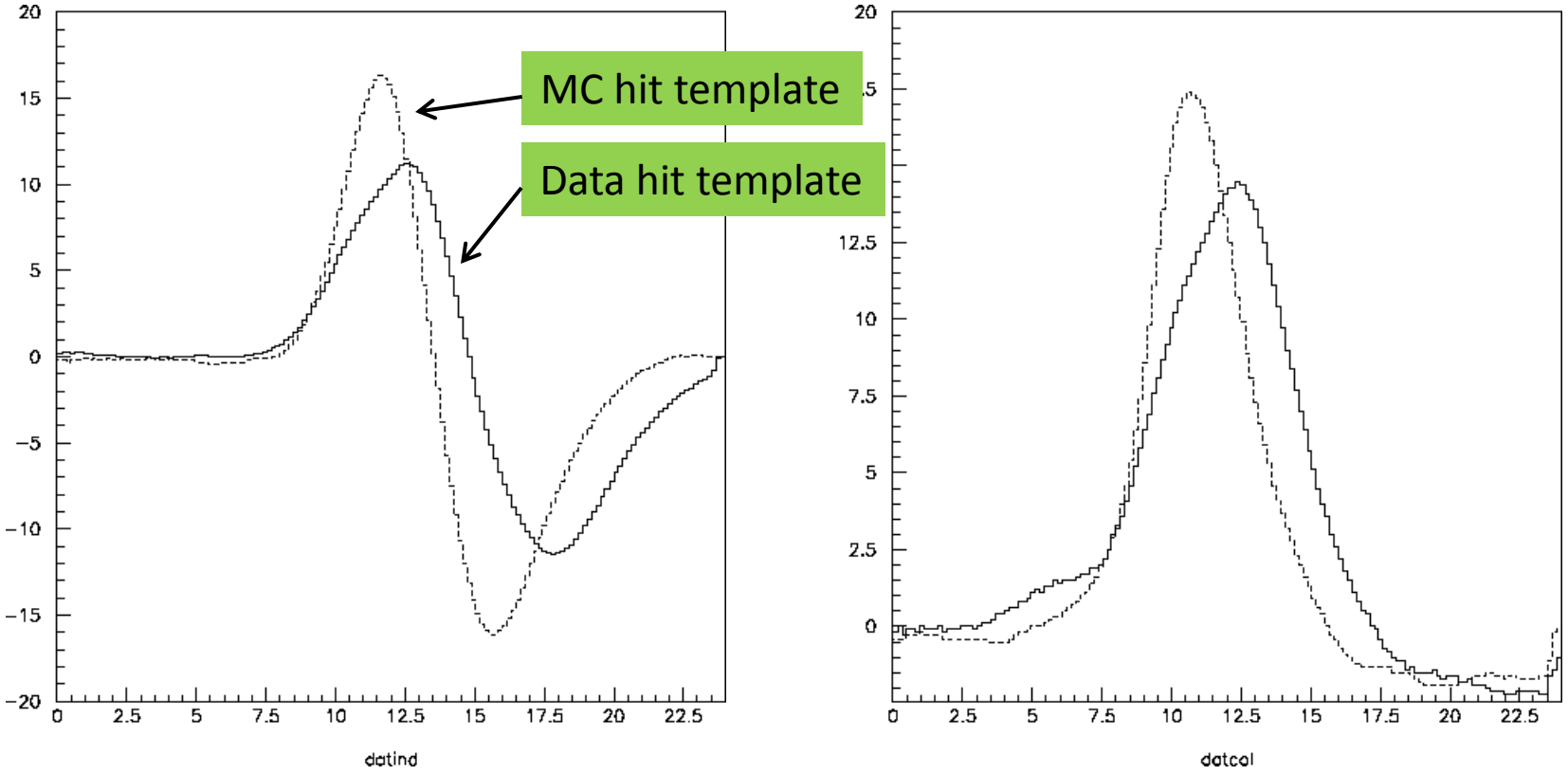
Garfield Response



Drift time/plane ~
6.2 mm/(1.6 mm/μs) = 3.9 μs

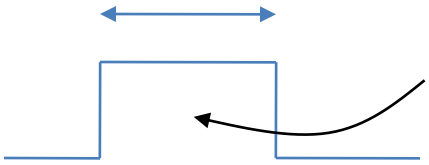
Garfield + Diffusion

Electronics gain = 1500 electrons/ADC count
Induction plane scale factor = 1.7
Standard 2D Garfield impulse response

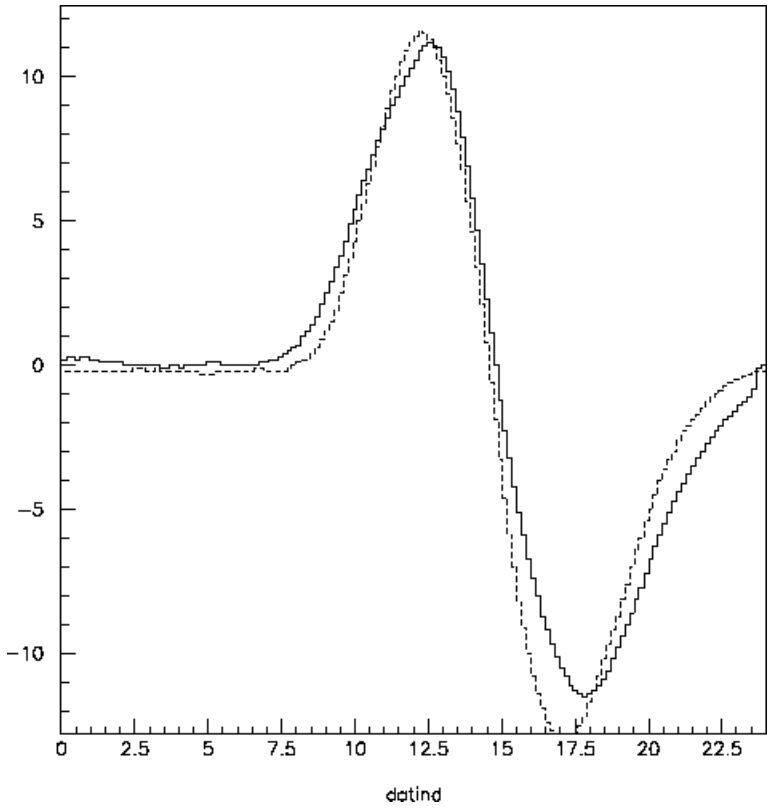


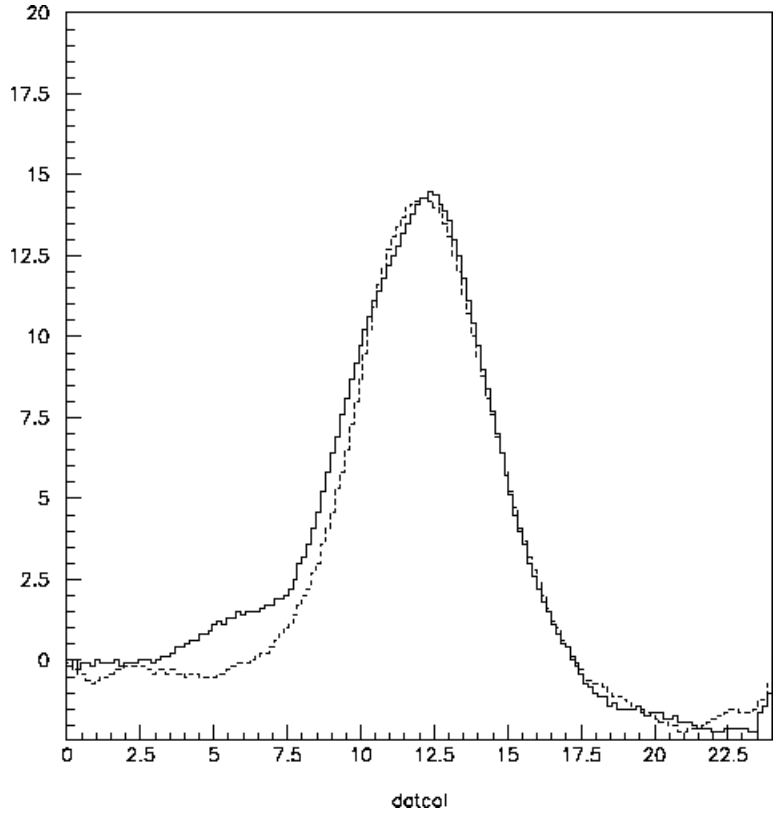
Garfield + Diffusion + Random Uniform Arrival Time

Electronics gain = 1500 electrons/ADC count
Induction plane scale factor = 1.7
Standard 2D Garfield impulse response



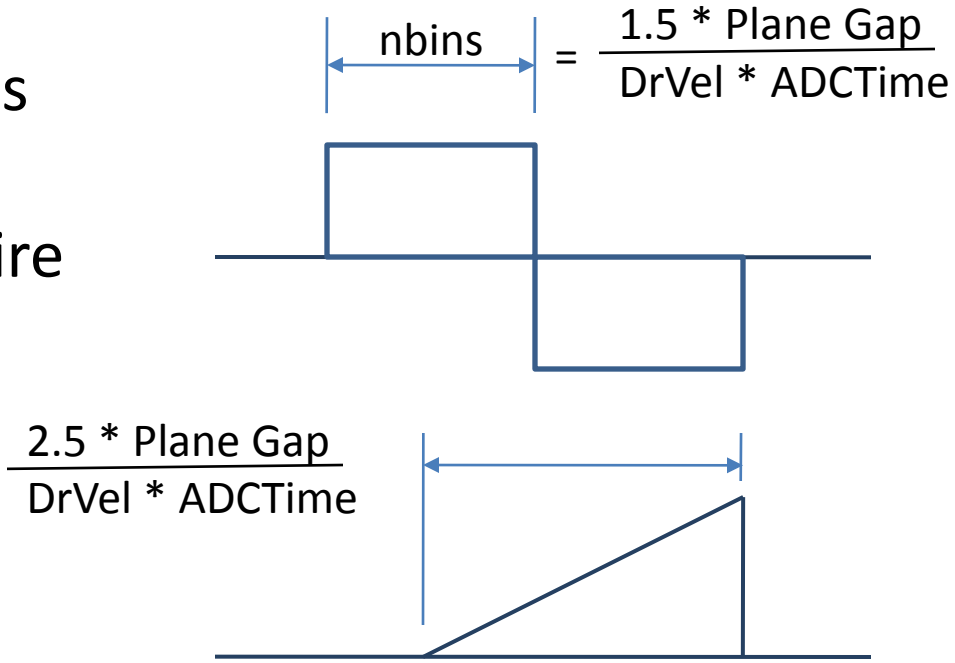
~40 electron clusters in 5 μs time window



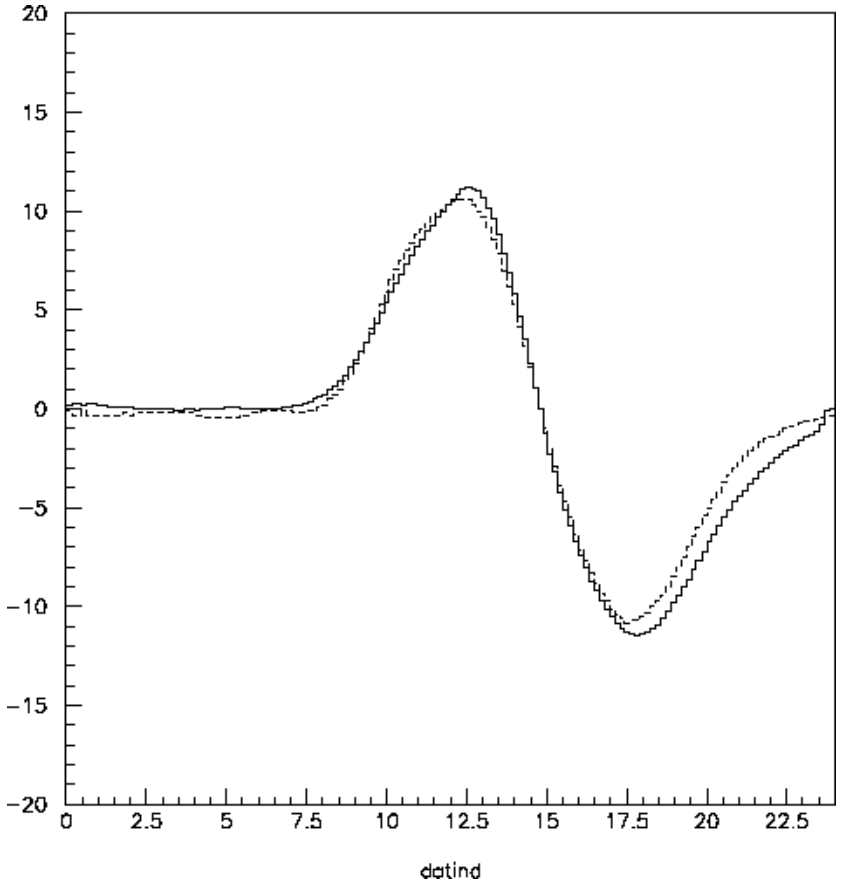


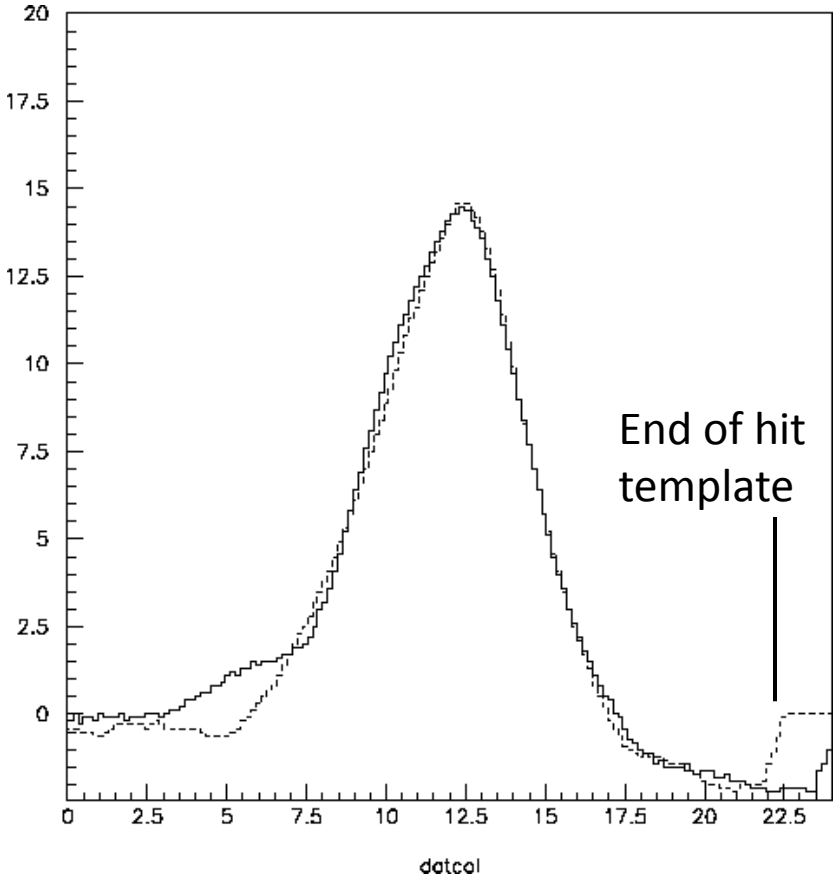
Simplified Simulation

- Detailed structure of Garfield signal (slide 3) is unimportant
- Actual drift time thru wire plane is longer than 2D simulation predicts
- Use simplified signal simulation
- Randomized cluster arrival time from diffusion only



Simplified Simulation Results





Conclusions

- Propose that we use the simplified simulation for now
  - No need for non-existent external data
  - Allows proceeding with code development
  - Level of signal simulation detail is dependent on the hit reconstruction algorithm
    - Can decide later if more detailed simulation is warranted